AD-A285 704

TATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	00/00/75	

4. TITLE AND SUBTITLE
FISHERY MANAGEMENT PROGRAM, ROCKY MOUNTAIN ARSENAL, AURORA, COLORADO, ADAMS COUNTY, SPECIAL PROJECT REPORT

5. FUNDING NUMBERS

6. AUTHOR(S)
MULLAN, J.

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
FISH AND WILDLIFE SERVICE
VERNAL, UT

8. PERFORMING ORGANIZATION REPORT NUMBER
81286R02

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED

12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)
RMA IS BEING ENGULFED BY THE URBAN SPRAWL OF DENVER. DESPITE URBAN ENCROACHMENT, THIS ARID HIGH PLAINS AREA SUPPORTS FAIR TO HEAVY POPULATIONS OF MULE DEER, PRAIRIE DOGS, RABBITS, HAWKS, OWLS, WATERFOWL, PHEASANTS, DOVES AND OTHER SMALL MAMMALS AND BIRDS. FISHING FOR BASE MILITARY AND CIVILIAN PERSONNEL IS PROVIDED BY LAKE MARY CONSTRUCTED IN 1960 AND PRIMARILY FED BY GROUND SEEPAGE. THREE OLDER IMPOUNDMENTS LYING ABOVE LAKE MARY, IN THE SAME DRAINAGE, BUT MAINTAINED BY THE DERBY CANAL, HAVE RECEIVED FISHERY MANAGEMENT CONSIDERATIONS IN RECENT YEARS. THE PURPOSE OF THIS REPORT IS THE COLLATION AND SUMMARY OF AVAILABLE FISHERIES DATA SO THAT IT MAY BE AVAILABLE TO THE ONGOING ENVIRONMENTAL AND DEMILITARIZATION PROGRAM.

14. SUBJECT TERMS
FAUNA, GROUNDWATER, CONTAMINATION, WILDLIFE

15. NUMBER OF PAGES

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED			

UNITED STATES DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Vernal, Utah

Special Project Report

F I S H E R Y M A N A G E M E N T P R O G R A M

Rocky Mountain Arsenal

Aurora, Colorado

Adams County

1975

Special Project Report

Fishery Management Program
Rocky Mountain Arsenal

by
James W. Mullan
Fishery Management Biologist

INTRODUCTION

Rocky Mountain Arsenal (27,000 acres) is located in Aurora, Colorado, a suburb of northeast Denver. The facility is being engulfed by the urban sprawl of Denver, particularly Stapleton International Airport just to the south, with the runways extending onto the Arsenal itself. Despite urban encroachment, this arid high plains area supports fair to heavy populations of mule deer, praire dogs, rabbits, hawks, owls, waterfowl, pheasants, doves, and other smaller mammals and birds. Fishing for base military and civilian personnel is provided by Lake Mary constructed in 1960 and primarily fed by ground seepage. Three older impoundments lying above Lake Mary in the same drainage, but maintained by the Derby Canal, have received fishery management considerations in recent years.

Three trips were made to the Arsenal in 1975: May 1, September 7 and 8, and November 3. Principal contacts included Major John C. Schmidt, Jr., Mr. Kelly McBride, Environmental Biologist, Mr. Randy Fairbanks, Wildlife Biologist, Mr. Chuck La Gross, Col. Gibson in charge of the environmental studies in progress, and Col. Gerald G. Watson, Base Commander.

Purpose of this report is the collation and summary of available fisheries data so that it may be available to the ongoing environmental and demilitarization program.

LAKE MARY

Following construction (1960), this six acre reservoir was stocked with 600 largemouth, 900 redear, 300 channel catfish fingerlings in 1961 along with 500 catchable-

size rainbow trout obtained from the Colorado Game, Fish and Parks Department. The president of the Rod and Gun Club in a letter of May, 1962 stated that the trout then averaged from one to three pounds in weight, and that the "bluegill" and largemouth averaged five inches in length.

The annual report for 1962 states that there were 1,055 fisherman-days expended on Lake Mary although the numbers and kinds of fish harvested were not disclosed. The annual report for 1963 reported a doubling of fisherman-days and a catch consisting mostly of rainbow trout, with some carryovers weighing 4.5 and 5.0 pounds each (Table 1). It also stated that channel catfish (to 4.5 pounds) and redear sunfish (to 1.25 pounds) contributed substantially to the fishery in that the fish, though few in numbers, were of large size.

In the ensuing 1964-69 period fishing pressure rose and stabilized in the range of 2,358 to 2,823 fisherman-days annually (Table 1). There was a two-fold increase in annual stocking of rainbow trout and a many-fold increase in the harvest of warm water fishes, mostly 3-4 inch bluegills. Coincidentally, redear sunfish disappeared, the catch of largemouth bass declined and the return of stocked trout decreased. Efforts to control the bluegill population through seining by base personnel was to little avail based on the voluntary creel census (Table 1) and gill netting (i.e. one experimental, over-night gill net set on 5/26/70 yielded: 79 bluegill, 3.5-5.4 inches; 11 black bullhead, 5.0-9.4 inches; and five trout, 7.0-13.9 inches).

Accordingly, with the lake drawn down 5-6 feet, 5 gallons of 5% emulsifiable and 50 pounds of 20% rotenone were applied by boat bailer, backpack pump and "mud-ball" to remaining water and sump areas on August 25, 1970. The kill was rapid and consisted of hordes of small bluegill, a few (only two observed) largemouth bass to 6 pounds, a large number of black bullheads to 12 inches in length, and a fair sprinkling of rainbow trout (perhaps 200). In the spring of the same year (1970), 3,000 catchable-size rainbow trout were stocked and the voluntary creel census showed 2,445 (82%) harvested before treatment of the lake.

In the years 1971 and 1972, the fisheries regained its

long-term eminence, but then went into a drastic decline in 1973 (Table 1). The reason for this was recontamination with undesired warm water fishes, first reported in 1971.

The 1970 reclamation was 100% successful in eliminating the then existing undesired fish species, as disclosed by subsequent sampling and reclamation. In refilling the lake in 1970, green sunfish were introduced, due to drawing on a canal source rather than a deep well. The green sunfish population quickly over-ran the lake. One overnight gill net set on 8/9/72 produced a catch of 50 green sunfish (2.5-6.4 inches), 21 channel catfish (8.0-14.9 inches), and two rainbow trout (9.0-9.4 inches). The channel catfish and rainbow trout originated from scheduled stockings. Coupled with the expansion of green sunfish densities, the weed problem had become more acute over the years, and so plans were laid to drain, rotenone and dredge the lake.

Drainage began in late August 1974 and the rotenoning was done in mid September (9/12). Hordes of 3-4 inch green sunfish, a few 4-5 pound largemouth bass, which originated in a flood-spill from the upstream Lake Ladora, and about 200 channel catfish up to eight pounds were killed. No bullhead or bluegill were observed, substantiating the claim to a complete kill of these species in 1970. No trout were observed as well.

The general deepening and enlargement of the reservoir has been underway since, utilizing a reserve engineering battalion, with completion paralleling this report. Prior to this renovation, Lake Mary was listed as six surface acres, composed of a main body of water nearest the dam, three adjacent cove areas, and an S-shaped canal connecting to a smaller open water area below the Lake Ladora dam that is the source of the appreciable ground seepage and springs (4 located in construction activities) that maintain the water level. The deepest portion of the reservoir at the west end near the dam covered an area nearly 100 feet wide by 200 feet long, averaging 6.5 feet deep with the deepest point being 9.5 feet. The remainder of the reservoir averaged only about four feet deep.

The dredging and excavation, conservatively estimated to have cost $25,000, has substantially deepened (perhaps to

15 feet average near the dam) and enlarged the reservoir. Banks have been sloped on a one-to-one basis, the dam appreciably raised and strenghtened, and a control dike and channel constructed to bypass flood water from upstream around the reservoir. Final landscaping with grasses and trees is scheduled for early spring 1976.

The reservoir has been gradually filling via ground seepage and springs since early summer, and as of mid December 1975 was about three-fourths filled. Restocking began 7/10/75 with 2,000 eight-inch rainbow trout, but unfortunately 30-40% died due to the large difference in water temperatures between the delivery truck and the reservoir. Plants of 1,500 and 2,000 rainbow trout on 9/10 and 12/9/75 experienced no mortality; 1,500 three-inch channel catfish (8 pounds) stocked 9/22 likewise experienced no mortality.

In summary, Lake Mary is illustrative of the problems and opportunities of management of small ponds in the arid high plains along the East Slope of the Rocky Mountains. Water is generally in short supply. Invariably the water available is too warm in summer for cold water fish such as trout, but too cold and limited in supply to create substantive habitat for warm water game fishes. On the other hand, water quality, while limiting in some respects, is not in itself lethal, while chemical constituents are generally highly favorable for fish food production. The relatively high standing crops of fishes estimated in both reclamations of Lake Mary, 100 to 200 pounds per acre, attest to this.

However, "put-grow-and-take" fisheries in such habitat is generally complicated due to several factors, all of which are interrelated. The density of fish stocked should not be so great as to exceed food productivity. Fortunately, rainbow trout and channel catfish, which have been demonstrated as the most compatable for survival and growth under what might be termed tepid water temperature regimens, will not reproduce in small pond habitat. Their numbers or population density therefore can easily be controlled by judicious stocking. Unfortunately, there are numerous, widespread warm water fish species, i.e., bluegill, green sunfish, bullheads etc., that are most difficult to keep out of such ponds, either naturally or through design, and which are capable

of vast reproduction and usurping the productivity without contributing to fishing. Such over-crowding or "stunting" is particularly detrimental to trout because of their demonstrated intolerance to competition from other fish, whether for food or space, and particularly if water temperatures are less than optimum in summer. The reconstruction of the reservoir will definitely enhance water quality, particularly for trout in the warmer summer months and at time of stocking. The threat of contamination by undesired fishes from upstream flooding is eliminated, and the weed problem vastly reduced as well.

LAKE LADORA, LOWER DERBY, AND UPPER DERBY

The three lakes (Ladora, 63 acres; Lower Derby, 45 acres; and Upper Derby, 73 acres) located to the east of Lake Mary in the same drainage, but supplied with water via the Derby Canal, were contaminated with chlorinated hydrocarbon wastes while under lease to a chemical company in the 1950's. Dr. D. Glen Crabtree, Assistant to the Director, B.S.F.W., Denver Wildlife Research Center, stated in a telephone conversation of 3/31/70 that the spill consisted of aldrin and dieldrin, that about 3,000 ducks died annually thereafter, and that the Army spent about $270,000 decontaminating the lakes by removing approximately six inches of the contaminated bottom materials.

He also stated that there was no post earth removal evaluation except for surviellance by State authorities for about one year when no duck mortality was observed. The 1966 annual report of the Bureau's Division of Wildlife Research, however, is somewhat contradictory. "The major areas of pesticide contamination at the Rocky Mountain Arsenal were eliminated in preceding years. However, mortality of ducks was observed in 1966···. Investigation revealed that the inlet canal had not been cleaned as the lakes had been, and samples of soil there contained about ten times as much pesticide as the cleaned areas."

Once this situation was corrected by filling in the old canal and digging a new one, the lakes were considered "cleaned."

At this juncture in time, apparently various people became involved in re-establishing a fish population, although this office has had no more success in documenting these reports than uncovering the pesticide content of bottom muds following the four-year decontamination program.

Mr. Crowswell Henderson, former leader of Pesticide Surveillance, B.S.F.W., Fort Collins, was of the impression that Dr. Oliver Cope and/or staff of the Division of Fishery Research, Denver Pesticide Laboratory, did some work on the problem. Dr. George Post, Professor of Fisheries, Colorado State University, in a telephone conversation of 3/31/70 was also of the opinion that some sort of effort to rehabilitate fish to these waters was made aside from salvage of bluegills from Lake Mary and transfer to Lake Ladora by base personnel in April, 1967.

The first recorded stocking of Lake Ladora occurred March 29, 1968, with 500,000 (16 pounds) northern pike fry. Gill netting by Dr. Post (while on temporary military duty) and personnel of the Vernal Field Station that summer and fall (a total of eight net days) resulted in a catch of only one green sunfish. The lack of fish was not inconsistent with the small size of the northern pike stocked and the vast abundance of dipterans, cladocerans, snails, frogs, water dogs, and other fish foods observed. Accordingly channel catfish, bluegill and largemouth bass were introduced later that fall and the following spring (Table 3).

Survival and growth of bluegills and largemouth bass through to May, 1970 was good (Table 4). Fathead minnows were also determined to be abundant at this time based on seining and observation.

Working through the Post Surgeon, Dr. Maurice D. Gaon, composite samples of the foregoing largemouth bass and bluegill, plus a control composite of bullheads from Lake Mary, were taken to the Spectran Laboratories, Denver, for pesticide analysis. All techniques and collection and handling methods were those employed in the National Research Monitoring Program. Results are shown in Table 5.

The dieldren content of the largemouth bass and bluegill

sunfish from Lake Ladora was found to be 3.94 ppm and 3.05 ppm, respectively. Replication of the fish analysis by other laboratories contacted by Dr. Gaon reportedly confirmed the original Spectran findings. Inasmuch as there is no allowable tolerance for dieldren in food, Lake Ladora remained closed to fishing until 1974, at which time it was openned to catch-and-release fishing out of deference to the dieldren problem.

Fishing was reported as excellent, a bass or jumbo size bluegill per cast, at least before the fish became educated. Largemouth bass to six pounds were reported, as well as one northern pike weighing 24 pounds, plus a scattering of northerns from 18 inches to 12 pounds in weight. Evidently these northern pike were the survivors of the 39 three-inch fish stocked 5/26/70 (Table 3). The writer personally examined one five pound northern found dead near the forebay to the pumping station on 5/23/74. It was estimated that Lake Ladora sustained a minimum of 1,000 fisherman days of use during 1974.

Catch-and-release fishing was also allowed in 1975, apparently with similar (Figure 2) but somewhat slower results than in 1974. On 9/8/75 two gill nets were set overnight in Lake Ladora and one net each in Lower and Upper Derby to determine if the northern pike had reproduced and to monitor changes in the fish populations. Results are compared with previous netting in Ladora in Table 4 and between reservoirs in Table 7 and Figure 3.

The most startling finding was that all three reservoirs are on the verge of being overrun with black bullheads. They were first noted in Lake Ladora in 1972 when three specimens were taken. Although netting effort was less in 1975 (2 net days versus 3 net days in 1972), 244 black bullheads were captured, whereas 205 and 150 were taken in Lower and Upper Derby, respectively, with one-half the netting effort (1 net day) of Lake Ladora. Although the size distribution of the bullheads in Lake Ladora is normal, with good representation in the 8-12 inch size classes, it would seem only a matter of time until overcrowding significantly reduced the average size of the population. This trend to smaller average size is evident in comparing the bullhead populations of the three reservoirs (Figure 3) and is more than likely accounted for in that the reservoirs are shallower and

more weed choked proceeding upstream from Lake Ladora to Upper Derby. It has been repeatedly demonstrated that excessive cover created by nuisance levels of aquatic weeds, that protect the smaller fish from being effectively preyed on by largemouth bass, invariably results in overcrowding by bullheads to the detriment of all other species.

The netting data comparison (Table 4) in general shows a diminution in the number of largemouth bass and a decrease in the size of the bluegills over the years as population density has increased. For example, in 1972 the 12 largest bluegills captured in the nets weighed almost 12 pounds. No one-pound bluegill were observed in 1975. Growth of largemouth bass remains reasonably good. Although growth is only 1.0-2.5 inches during the first year of life, due to spawning successfully only in late June or July, as a result of the strong radiation of the water's warmth at night in this dry, high elevation, growth in later years is faster (3.0-4.0 inches annually). Growth of bluegills, however, appears to be declining. One-pound bluegills in 1972 were four year-old fish with an average size of 8.5 inches or better; in 1975 four year-old bluegill were 7.5 inches or much less.

A contraction in size and growth of prey species is normal as the available niches in an environment are filled and the finite food supply is shared by more and more mouths, so the advent of yet another species in Lake Ladora, yellow perch, with a relatively fast growth rate, may seem anomalous. However, a subsample of the scales from the 32 yellow perch (4.5-7.4 inches) captured in Lake Ladora in 1975, indicated that they were all one plus years old. This suggest a new arrival, no doubt via the Hi Line Canal that feeds the system via Upper Derby, and that population density of the species is still low. Along with the expansion of the black bullhead population, the presence of the yellow perch is ominous, because unlike the largemouth bass and the bluegill, spawning occurrs at water temperatures of 44° - 50°F. And, the species is notorious for over populating and stunting in Western waters.

No northern pike were sampled. Small northern pike, possibly young-of-the-year and yearlings definitely, should have been captured if present; however, it is

questionable whether the few survivors from the 1970 introduction would have been captured out of deference to scarcity and territorial behavior at this season. From this it only can be concluded that northern pike have not established themselves naturally, although the reports of 18-inch fish caught by fishermen in 1974 may belie this. In any event, such failure of natural reproduction may in part be due to limited numbers of mature northerns. The most consistent concensus of Arsenal personnel is that between 15 and 20 northern pike, or about one-half the number stocked, have been caught in the last two years, (Figure 2). This and considerations of natural mortality, documented in one instance on 5/23/74 by the writer, argues for a very limited stock of spawners.

CONCLUSIONS AND MANAGEMENT RECOMMENDATIONS

Like Lake Mary, these reservoirs present both management problems and opportunities, and the challenge of resource responsibility as well. Avoidance of the latter would be easy here due to the pesticide problem; close the fishing and relegate to a skeleton in the closet. However, this would be to ignore the fact that these reservoirs produce an appreciable crop of ducks, geese and coots, as well as serving as habitat for thousands of migratory waterfowl annually, which fly elsewhere.

Perhaps of equal or greater importance such inaction would circumvent ever realizing the possibilities of the situation. Particularly pertinent, the writer believes, in the fact that in a recent world-wide survey of lake rehabilitation techniques and experiences, involving over 700 cited references, Lake Ladora and the Derby Reservoirs appeared as the only lakes ever seriously contaminated with a chlorinated hydrocarbon (Dunst, 1974). On the other hand, many noted research personnel have acknowledging a widespread problem by pointing out the need for chronic toxicity studies of the effects of insecticides on aquatic forms and the need for knowledge on their degradation or elimination in natural environments.

Dieldren - to which aldrin converts after application - is a persistent, long-lived pesticide believed to induce cancer in man. The results of recent research on these

pesticides need to be examined and collated in the light of the massive contamination that occurred in Arsenal reservoirs. Such a preliminary study should be illustrative of the feasibility of removing the dieldren content from the reservoirs through mechanical cutting and harvesting of the weeds, primarily pondweed (Potamogeton) and parrot-feather (Myriophyllum). Laboratory and limited field studies have demonstrated how pesticides are readily taken up by aquatic vegetation (up to several thousand ppm).

Insofar as catch-and-release fishing representing a health threat to the public, should some fish be retained and eaten, it should not be overlooked that the roe and viscera of a number of delectable fish, saltwater blowfish for exampl , are highly poisonous. Theoretically, major content of pesticide residue should be in the viscera which would be discarded on dressing of the fish. However, any overview analysis of the dieldren problem as proposed should quantify by species, especially the bullhead which have not been analyzed before, the threat posed from eating such fish.

As already indicated, the acute aquatic weed abundance of the reservoirs poses a threat to maintaining a suitable predator-prey fish ratio. The distinct possibility exists that stunted bullheads and yellow perch will come to dominate the fish population, due to the excessive cover provided by the weeds. To help ameliorate this problem and to provide a supplementary fish food organism, the crayfish (Orconectes causeyi) was introduced to these reservoirs in 1975 (200 immature and 49 adults to Lake Mary, 110 adults to Lake Ladora, 120 adult to Lower Derby, and 6 adults provided to the environmental study for determining background levels of pesticide content).

The weed control and fish food value of O.causeyi has been described by Dean (1969). This species is endemic to the Arkansas and Rio Grande Drainages of New Mexico and presumably, is found in these same waters in Colorado. They never will become sufficiently abundant to fully control the aquatic vegetation because of the presence of predaceous warm-water fish and the overall lack of rock substrate as habitat. However, they should effect some control in the riprap along the face of the dams and, at this juncture,

any control of the weeds at all would represent a bonus.

Under present circumstances, the most practical option in reducing and controlling the further expansion of the overabundant panfishes appears to lie in stocking northern pike. By no means is this recommended as a panacea. The Colorado Division of Wildlife's experience with this management tool (Horak, 1967; Powell, 1973) and the failure of establishing a viable spawning population in Lake Ladora argues against a 100% success. On the other hand, other options, i.e., chemical control, appear even less likely to succeed over the long-term, i.e., recontamination via the Hi Line Canal. Accordingly, to control the panfish, based on the Colorado experience (Powell, 1973), it is recommended that northern pike be stocked at a minimum of 50 two-inch fish per surface acre (Ladora = 3,150 fish; Lower Derby = 2,250 fish; Upper Derby = 3,650 fish). In addition, the reservoirs should be stocked for a minimum of two successive years, and the northerns should be protected by a 20-inch size limit.

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Reviewed by:

Area Supervisor
Planning and Assistance

Distribution:

Washington, Pesticides - 3
Washington, P.A. - 3
Regional Office, P.A. - 4
Regional Office, Pesticides - 1
Regional Office Hatcheries - 3
Area Office - AV
Vernal Field Office - 12
Rocky Mountain Arsenal - 6
Leadville NFH - 1

Hotchkiss NFH - 1
Rolf Nittman, Colorado Division of Wildlife - 2
Field Stations - 10

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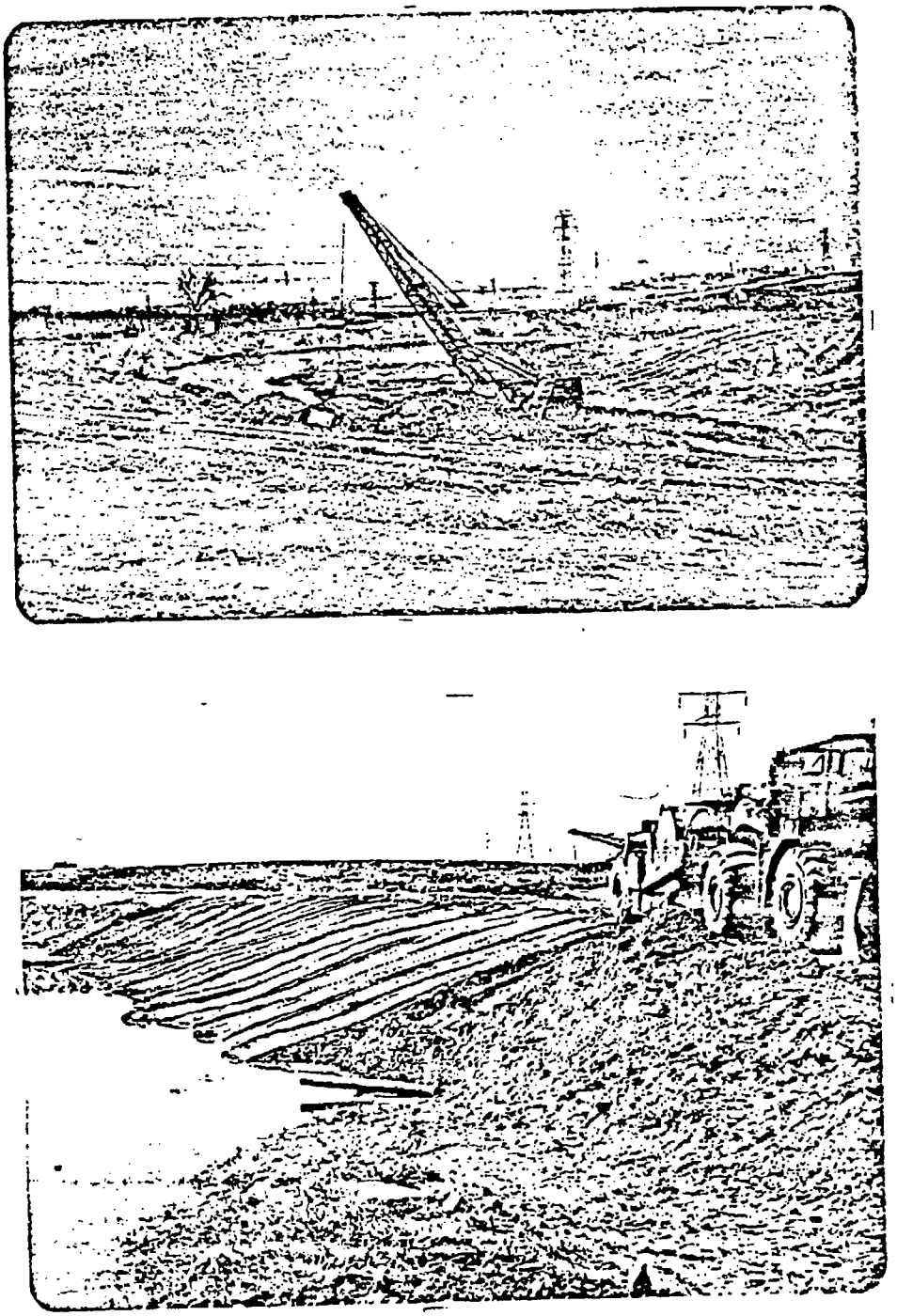

Figure 1. Enlargement and deepening of Lake Mary, 1975.

Figure 2. Nine pound, 36" northern pike caught by hook-and-line in Lake Ladora, May 1975. Photo Courtesy Major John C. Schmidt.

Figure 3. Length-frequency histogram, black bullheads, Rocky Mt. Arsenal Reservoirs, 9/9/75.

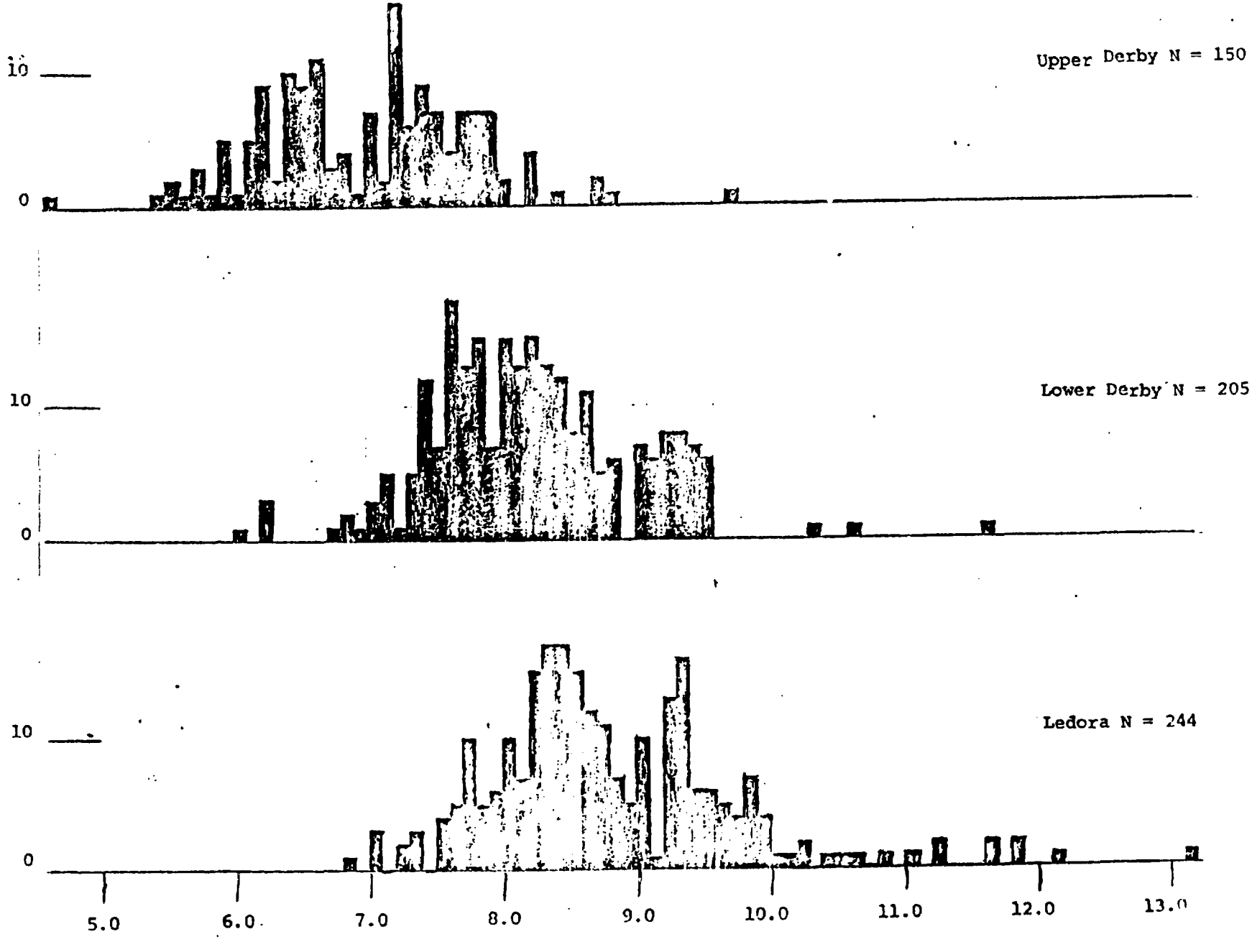

Table 1. Available voluntary creel census statistics, Lake Mary, 1963 through August 1974.

Year	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Angler days	806 [1]	1941	2753	2327 [3]	2567 [4]	2547	2458	1783	2497	2811	1150	782 [6]
Angler hrs.	1667	3016		5130	6685	5606	6065	4080	5185	5563	2550	967
Av. trip hrs.	2.1	1.8		2.2	2.6	2.5	2.5	2.3	2.1	2.0	2.2	1.2
Catch/hour												
All fish	0.80	0.77		0.86	1.6	1.1	1.5	2.0	0.92	1.19	1.02	-
Trout	0.64	0.46		0.39	0.62	0.50	0.53	0.59	0.92	1.0	0.82	0.77
Harvest	1337	2342	4878 [2]	4713	10,970	6153	8973	8167	4794	6208	2609	-
Rainbow trout	1063	1392	2890	2003	4193	2850	3195	2445	4774	5563	2550	700
Large-mouth bass	43	182	116	74	15	100	52	24	1 [5]	0 [5]	10 [5]	-
Bluegill	220	685	1682	2531	5826	2900	5054	4974	8	556	510	5 [7]
Catfish	11	83	190	105	936	303	672	724	11	85	16	89
Trout stocked		2000	4000		7000	8196	8000	3000	9750	8000	6900	5900
Returned		77%	72%		60%	35%	40%	82%	49%	70%	28%	12%

1/ July-December only; 2,000 angler days estimated for year. 2/ Through October only. 3/ Through October only; 2,724 angler days estimated for year. 4/ January through July; 2,823 angler day total estimated. 5/ Listed as bluegill, but actually green sunfish. 6/ Through August only. 7/ So numerous anglers could not keep track.

Table 2. Physical-chemical characteristics of Lake Mary and Lake Ladora, Rocky Mountain Arsenal.

	Lake Mary (6 surface acres)	Lake Ladora (63 surface acres)	
Date	5/26/70	8/27/69	5/26/70
Water temperature (F.)	1' = 73° 2' = 72°	70°	1' = 71° 8' = 69°
Air temperature	85°	94°	85°
Specific conductance (micromhos)	535	370	515
p.H.	8.2	8.2	8.2
Oxygen (ppm)	11	5-6	10
Phenolphthalein alkalinity (ppm)	51		42
Total alkalinity (ppm)	145		154
Transparency (ft)	4		8

Water temperatures and oxygen checked periodically during warm months 1971-75: maximum temperature of surface water found, 77°F., average as above. Oxygen averages around 6.0 ppm, with lows in the 4.0-5.0 ppm range.

Table 3. Stocking history, Lake Ladora (63 acres), 1968-1970.

Species	Number	Size	Weight	Date
Northern pike	500,000	Fry	16 lbs.	3/29/68
Channel catfish	5,000	3"	15 lbs.	10/16/68
Largemouth bass	16,000	2"	16 lbs.	6/19/69
Bluegill sunfish	4,000	2"	14 lbs.	6/19/69
Northern pike	32	3"	1 lb.	5/26/70

Table 4. Fish samples length frequencies from Lake Ladora 1970, 1972, 1975.

	5/26/70 3 gill net days				8/9/72 3 gill net days				9/9/75 2 gill net days					
Inches	Large-mouth bass	Blue-gill sun-fish	Green sun-fish	White sucker	Large mouth bass	Blue-gill sun-fish	Green sun-fish	Black bull-head	Large-mouth bass	Blue-gill sun-fish	Green sun-fish	Yellow perch	White sucker	Black bull-head
3.0-3.4						6				1				
3.5-3.9						7								
4.0-4.4						10	1			12				
4.5-4.9		1				13				27		1		
5.0-5.4		6			1	19	1			11		2		
5.5-5.9		12				16				13		4		
6.0-6.4	2	15	1		1	14	6			20		18		
6.5-6.9	6	9			1	8	8			15		5		1
7.0-7.4	6					6	6		1	17		2		8
7.5-7.9	6					4				10				30
8.0-8.4	13					8	1			6	1			66
8.5-8.9	17					12				2				50
9.0-9.4	12					6			1					46
9.5-9.9	15				1	2			1					26
10.0-10.4	2				1				1					5
10.5-10.9	1				6				1					3
11.0-11.4					16			1						3
11.5-11.9					12			1	2					4
12.0-12.4					5									1
12.5-12.9					2				1					
13.0-13.4					2			1						1
13.5-13.9									1					
14.0-14.4				1										
14.5-14.9														
15.0-15.4														
15.5-15.9													1	
Tot. No.	80	43	1	1	48	131	23	3	9	134	1	32	1	244

Table 5. Chlorinated hydrocarbon pesticide residue content in three 5 - fish composite samples, Lake Ladora and Lake Mary, May 1970. (No other hydrocarbon residues were detected other than those indicated). Analysis by Spectran Laboratories, Denver, Colo.

#1 Largemouth bass - Lake Ladora

Length	Weight	Compound	Concentration
9.8"	9 oz.	Aldrin	0.08 ppm
9.8"	8 oz.	DDE	0.30 ppm
9.9"	9 oz.	DDD	0.03 ppm
9.5"	9 oz.	DDT	0.02 ppm
9.8"	11 oz.	Dieldrin	3.94 ppm

#2 Blue gill Sunfish - Lake Ladora

Length	Weight	Compound	Concentration
5.9"	4 oz.	Aldrin	0.01 ppm
5.9"	4 oz.	DDE	0.10 ppm
6.5"	6 oz.	DDD	0.01 ppm
6.0"	4 oz.	DDT	0.01 ppm
6.5"	7 oz.	Dieldrin	3.05 ppm

#3 Bullhead - Lake Mary

Length	Weight	Compound	Concentration
7.2"	3 oz.	Aldrin	0.01 ppm
5.7"	2 oz.	DDE	0.43 ppm
6.6"	3 oz.	DDD	0.14 ppm
6.9"	3 oz.	DDT	0.11 ppm
9.4"	8 oz.	Dieldrin	0.31 ppm

Table 6. Chlorinated hydrocarbon pesticide residue analysis of water and fish from Lake Ladora after 1970, apparently representing only a portion of the replication done.

(1) One pint water tested for dieldren by Sixth U.S. Army Medical Laboratory, Fort Baker, San Francisco, California 5/24/71, = 0.0025 ppm, maximum permissible 0.017 ppm.

(2) Four largemouth bass, same laboratory and date as above: average; 3.28 dieldrin (whole basis); range 2.42 to 4.64 ppm.

(3) One gallon water, same laboratory as above, but 6/24/71 = less than 1.0 ppb.

(4) Five largemouth bass, Fifth Army Medical Lab., St. Louis, Mo., June 1970: Dieldrin = 2.7 ppm; Aldrin = 0.04 ppm; Endrin = 0.07 ppm; DDE = 0.10.

(5) Five largemouth bass, 10/22/70, evidently same laboratory as preceeding; Dieldrin = 5.6 ppm; Aldrin = 0.05 ppm; Endrin = 0.06 ppm; DDE = 0.13 ppm.

(6) Apparently, during 1970, Walter Reed Hospital Laboratory also tested fish samples from Lake Ladora and obtained results similar to preceeding.

(7) Two largemouth bass, Sixth U.S. Army Medical Laboratory, Fort Baker, San Francisco, California, 6/7/72; Aldrin = 0.013 ppm, Dieldrin = 0.064 ppm.